Statement of
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Chairman Duncan, Members of the Committee. It is a distinct privilege to participate in this important and most timely hearing and I want to thank the Committee for the opportunity.

I am Gerald E. Galloway, a Glenn L. Martin Institute Professor of Engineering at the University of Maryland where I teach and do research in civil engineering. I came to that position following a 38 year career in the US Army and eight years service in the federal government, most of which was associated with water resources management. I served for three years as District Engineer for the Corps of Engineers in Vicksburg, MS and later, for seven years as a member of the Mississippi River Commission. I also serve, on a part-time basis, as a visiting scholar at the Corps of Engineers Institute for Water Resources in Alexandria, VA and as a consultant to a number of organizations. In 1993 and 1994, I was privileged to be assigned to the White House to lead an interagency study of the causes of the Great Mississippi River Flood of 1993 and to make recommendations concerning the nation's floodplain management program, and it is largely on the basis of that study that I am here today.[1] The views I express today are my own and do not necessarily reflect those of the University of Maryland or the Institute for Water Resources.

My message is simple. The massive flooding that occurred in New Orleans during Hurricane Katrina was, in part, a reflection of a growing lack of attention to our national flood damage reduction program. The United States, which for much of the latter half of the twentieth century had both a well understood national flood protection policy and equally clear programs that followed from that policy, has allowed this policy and those programs to atrophy over the last twenty years. As a result, today:

- People and property are at risk in flood prone communities across the country.
- The level of protection we now provide to many flood prone communities is less than is needed and leaves those provided this inadequate protection at risk and not knowing they are at risk.
- The responsibility for conceiving, funding, constructing, maintaining and operating flood damage reduction projects is diffuse and not clearly defined. The responsibility of individuals to participate in their own protection and in the mitigation of potential damages to their property is similarly not clear.
- Insufficient funds are available to ensure the integrity of many of our flood damage reduction structures. If the federal and state governments provide flood protection structures, the public expects that they will be well maintained and many are not.

- Steps must be taken to establish a clear national policy with respect to flood damage reduction goals and responsibilities.

Eleven years ago, a federal interagency review committee, formed within the White House and charged to conduct an in-depth analysis of the problems connected with the 1993 Mississippi River Flood, identified and reported to the President and the Congress nationally significant challenges that governments needed to address. For the most part, the lessons we are learning from Katrina are the same lessons we learned from the 1993 Flood.

In response to this interagency study, governments took action on some of the report's 60 recommendations; however many of the recommendations fell into the "too hard box" and nothing was done to deal with them. Significant actions remain to be taken.

Our committee made three fundamental points:

1. Floods and hurricanes are natural events and will continue to occur. Under climate change flooding may be exacerbated. This year has already seen 'newsworthy flood events in most parts of the country.

2. Management and funding of protection activities in the floodplain – whether it be along the Gulf Coast or in the lowlands of Louisiana, or anywhere else in the United States, is the shared responsibility of federal, state, and local governments, businesses and those who live in or work in the floodplain. Each element must know its task and do its part while working in collaboration with others to reduce the overall risk to life and property. Flood damage reduction should not be just a federal activity.

3. As a nation, we need to take action to:
   - Reduce the vulnerability of those in flood hazard areas
   - Streamline the bureaucratic process for dealing with flood vulnerability
   - Concurrently preserve and enhance the natural environment. In many cases this protection and enhancement of the environment will contribute significantly to flood damage reduction.

Let me highlight the more important 'un-actioned' recommendations of our study:

- To reduce the vulnerability of those in the floodplain, governments need to:

  - Provide a high level of protection to those who live in existing population centers and pay special attention to protection of critical infrastructure such as hospitals, water treatment facilities and fire stations. New development in the floodplain - without a specific need to be located in the floodplain - must be discouraged.

    - We recommended that population centers be given a higher level of protection than most now have – protection against the standard project flood – which is roughly equivalent to a 500 year event.[2] When the nation started its flood control efforts in the late 1920's and early 1930's, it stated that "…destructive floods

upon the rivers...constitute a menace to national welfare; it is the sense of Congress that flood control is a proper activity of the Federal Government."[3] The standard project flood or higher level of protection was the norm. The mission was straightforward, "Don't let catastrophes happen." Over the last 70 years, we have lowered the protection provided by many federal projects to the 100 year level, a level that has a one in four chance of being exceed in the life of a 30 year mortgage. It is amazing to me that the capital city of California, Sacramento, is only protected to the 100 year level. Can the nation afford to risk losing another major metropolitan area?

This lowering of the standard has resulted from a combination of:

- A fixation on economic benefit-cost ratios to the exclusion of non-economic factors. [4]
- An unwarranted belief that the 100 year standard of the National Flood Insurance program represented a safe level of protection for a levee system. While it may be adequate for insurances purposes and for elevating individual buildings, it does not adequately address the catastrophic losses that occur when levees are overtopped or fail.
- The institution of cost-sharing where local sponsors were only willing to fund a minimum level of protection.

- The front door to New Orleans, along the Mississippi River, is protected with levees at a higher than standard project flood level, approximately 700 year protection, while the back door, the Hurricane protection levees along Lake Pontchartrain, built decades after the Mississippi River levees, provides only the equivalent of 200 - 300 year protection. Many of the other levees protecting the New Orleans area from the Gulf of Mexico provide even less protection. (New Orleans also faces a serious internal drainage flood hazard, and fixing levees only solves part of the problem.)

- In the Netherlands, governments provide 10,000 year protection along the North Sea coast, the equivalent of our hurricane protection, and 1250 year protection along the major rivers.

- Use all the tools available to reduce flood damages. This means use of not only structural means such as levees, floodwalls, and dams, but also non-structural approaches such a floodproofing, voluntary relocation of homes and businesses, revitalization of wetlands for storage, and use of natural barriers such as the Louisiana wetlands. Long before Katrina, both engineers and environmentalists had pushed this non-structural approach as a part of a comprehensive solution to Louisiana's hurricane protection problems.

- Recognize the inherent vulnerability of levees. The levee challenge is not unique to New Orleans. Sacramento sits behind a levee. Major areas of Los Angles are protected by floodwalls and there are floodwalls and levees in many other large cities across the country.

- Throughout the country there are thousands of mile of levees, some built by the federal government, others by developers or individual landowners and we have no accurate measure of the location and integrity of many of these levees.[5] The lack of knowledge about levees that was identified in the 1994 report still exists today and the conduct of a national assessment of levees should have a high priority.

  People who live behind a levee see protection but all levees are not equally strong nor do they provide the same level of protection. And, those who live behind levees remain subject to the residual risk of levee overtopping or failure. Lest there be a misunderstanding, I do believe that well constructed and maintained levees can provide sound protection against floods of the magnitude for which they were designed – the issue is level of protection and maintenance of levee integrity.

- Because a residual risk of flooding exists for all who are behind levees, the committee recommended that the government require flood insurance purchase by those who live behind levees and who are now exempt from the requirement to buy such insurance. Insurance on property behind levees is typically cheaper than normal flood insurance.

- Charge higher insurance rates to those whose homes are repetitively damaged and limit assistance to those who could have bought insurance and did not

- Provide adequate funding to support maintenance and necessary upgrades of flood damage reduction works. This is a challenge that must be addressed by governments at the federal, state and local levels. The American Society of Civil Engineers' (ASCE) two report cards for national infrastructure assign an overall grade of D to the condition of our basic infrastructure and water infrastructure is no exception. The need for upgrades and improved maintenance of the New Orleans system was well known and the same can be said for structures 'defending' many other locations. Over 300 miles of main line Mississippi River levees are below the design grade and section, yet funding is not available at the state or federal levee to deal with this challenge to the system's integrity.

- To streamline the process of dealing with flood damage reduction:

  - The Congress and the Administration, together with the governors, need to define the responsibilities for floodplain management at each level – so there are no seams and no dropped balls and adequate funding can be provided to at least take care of what maintenance and upgrades are required. The committee recommended that the Congress and the Administration, in coordination with the states, develop a Floodplain Management Act to spell out national goals and responsibilities.

  - The President needs to update the Executive Order (11988) that governs the actions of federal agencies with respect to floodplain management. The current Executive Order dates back to 1977 and much has changed in the world since then. The President also needs to address coordination among federal agencies so that overlaps, duplications and conflicts in procedures can be identified and eliminated.

3. Finally, the committee recommended that the federal government needed to take actions, as it carried out flood damage reduction, to concurrently preserve and enhance the natural and social environment. We recommended that the President revise the *Principles and Guidelines* for water resources planning, the federal document which directs the actions of federal water agencies.[6] The current document was signed by President Reagan 22 years ago and establishes national economic development as the sole objective of federal water development actions. It gives scant attention to social impacts of the kind we saw in the eyes of the displaced families in New Orleans or to deal with the loss of thousands of lives. We recommended that environmental quality, to include broader social goals, be established as a co-equal objective to national economic development. It is interesting to note that the 1965 Corps of Engineers Manual discussing levels of protection for flood damage reduction projects indicated that the selection of the design flood "…should not be governed by estimates of average annual benefits of a tangible nature alone… particularly when protection of high class urban or agricultural areas is involved. Intangible benefits, resulting from a high degree of security against flooding of a disastrous magnitude, including the protection of life, must be considered in addition to tangible benefits that may be estimated in monetary terms."[7]

In addition to the above, the Committee also pointed out that:

- Flood issues need to be dealt with in a watershed context and in a comprehensive manner. It is important to identify how actions taken in one part of a basin to stem flooding may impact the flooding for people who live in other parts of the basin. Comprehensive planning – integrated water resources management – also requires that flood damage reduction efforts be undertaken with full consideration for other aspects of water resources use. In the case of the protection of New Orleans, comprehensive planning would dictate that any plans take into account not only flooding but also the interrelationships with navigation, environmental restoration, and water supply and water quality.

- Neither federal nor state governments have knowledge of the extent of the risk the nation faces in the floodplain. The committee recommended that FEMA, in cooperation with the states undertake an inventory of flood prone structures. The committee also recommended that, in the face of indications that problems exist, the Office of Management and Budget direct federal agencies to assess, through scientific sampling, the vulnerability of federal facilities and major projects funded by the federal government.

- Flood Maps are frequently out-of date and as a result do not necessarily reflect either current or potential future conditions. The committee recommended use of emerging technologies to speed map improvements across the nation. The current FEMA Map Modernization Program is a major step in this regard and merits continued funding support. The use of up to date GIS will assist not only floodplain residents but those who must work to protect them.

- Federal agencies need to work closely with each other and the states before, during, and after floods to avoid conflicts, ensure coordinated programs and provide a single federal face. This was not the case during the 1993 Mississippi flood event. The recently instituted pilot program of FEMA, the Corps of Engineers and several states to establish closer working relationships – the "Silver Jackets Program" - is a step in the right direction.

In Conclusion

A flood catastrophe represents a national security issue. Floods especially attack the poor, the disabled and the elderly. They affect our people, our economy, and our environment. How to deal with them has been the subject of many studies over the years and we keep coming back to the same recommendations.

In the future we need to take an approach to flood damage reduction that brings all of the players to the table in a collaborative approach that shares responsibilities and funding. The federal government, acting alone, may not be able to afford new projects but, where it already has been committed to provide protection and where it now provides protection, it has an obligation to provide an appropriate level of protection and to carry out the maintenance necessary to insure system integrity.

Given the tragedies we have seen over the last weeks, the governments and the public must be prepared to take action to 'do it right' – to take recommendations out of the too hard box and move ahead.

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[1] Interagency Floodplain Management Review Committee, Executive Office of the President. 1994. *Sharing the Challenge: Floodplain Management into the 21st Century.* Washington, GPO. (available at http://www.floods.org/Publications/free.asp)

[2] The Standard Project Flood is derived from "…the most severe flood producing rain fall depth-area duration relationship and isohyetal pattern of any storm that is considered reasonably characteristic of the region in which the drainage basin is located, giving consideration to the runoff characteristics and existence of water regulation structures in the basin…The Standard Project Flood is intended as a practicable expression of the degree of protection that should be sought as a general rule in the design of flood control works for cities where protection of life and unusually high-valued property is involved."
(US Army Corps of Engineers. Engineer Manual, 1110-2-1411. "Standard Project Flood Determinations." Washington: CECW, 1 March 1965)

[3] 1936 Flood Control Act. 33 USC 701a.

[4] "The "design flood" for a particular protect my be either greater or less than the standard project flood, depending to an important extent upon economic factors and other practical consideration governing the selection of design capacity in a specific case. However, selections should not be governed by estimates of average annual benefits of a tangible nature alone, nor should construction difficulties that may prove troublesome but not insurmountable be allowed to dictate the design flood selection, particularly when protection of high class urban or agricultural areas is involved. Intangible benefits, resulting from a high degree of security against flooding of a disastrous magnitude,

including the protection of life, must be considered in addition to tangible benefits that may be estimated in monetary terms." (Engineer Manual, 1110-2-1411)

[5] The *Sharing the Challenge* report indicated that levees are "constructed by different agencies and individuals at various times and under various times and under various programs, have very few common characteristics. Their physical composition varies by reach of the river. Some are on the riverbank while others are set back appropriately to permit flood flow conveyance. Many of those built in areas subject to swift currents during floods or over formerly active channels are destined to fail again and again. Most non-federal levees were built without any substantive understanding about impacts on river hydraulics and the riparian environment. Many of the federal levees were built prior to the availability of river hydraulic models and geologic maps that could provide such needed information. In some cases flows have increased for the same meteorological conditions because of upstream development. Determination of the level of protection provided by a levee is an important piece of information frequently difficult to obtain." (*Sharing the Challenge*, p 143)

[6] US Water Resources Council. "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies." Washington: March 10, 1983 (http://www.iwr.usace.army.mil/iwr/pdf/p&g.pdf)

[7] Engineer Manual, 1110-2-1411

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He has been a consultant to the Executive Office of the President, and has assisted the U.S. Water Resources Council, World Bank, Organization of American States, Tennessee Valley Authority, U.S. Army Corps of Engineers and various other organizations in water resources related activities. He was appointed by President Reagan to the Mississippi River Commission and served on the Commission for seven years. He was also a presidential appointee to the American Heritage Rivers Initiative Advisory Committee. Following the disastrous 1993 Mississippi Flood, he was assigned to the White House and led an interagency study that investigated the causes of that flood and made recommendations to improve the nation's floodplain management. He is a past member of the Board the Hudson River Environmental Society and is currently serving as a Director of the Hudson River Foundation for Science and Technology. He commanded the Army Corps of Engineers District in Vicksburg, Mississippi from 1974 to 1977 and has served on the faculty of the U.S. Military Academy at West Point. In 1990, he was promoted to Brigadier General and appointed the ninth Dean of the Academic Board (Chief Academic Officer) of the Military Academy. He retired from active duty after a 38 year military career.

Dr. Galloway holds master's degrees from Princeton, Penn State, and the U.S. Army Command and General Staff College. Dr. Galloway received his Ph.D. degree in geography from the University of North Carolina. Dr. Galloway is a member of the National Academy of Engineering, a fellow in the American Society of Civil Engineers and an Honorary Diplomate of the American Academy of Water Resources Engineers and a registered professional engineer in New York.